

Claims

[c1] What is claimed is:

1. An electron emitter assembly, comprising:
a light source configured to emit light;
a photo-responsive device operably coupled to an electron emitter device, the photo-responsive device inducing the electron emitter device to emit electrons in response to receiving the light; and
an anode receiving the emitted electrons from the electron emitter device.

[c2] 2.The electron emitter assembly of claim 1, wherein the anode is configured to emit x-rays in response to receiving the emitted electrons from the electron emitter device.

[c3] 3.The electron emitter assembly of claim 2, further comprising:
a housing having a light receiving window configured to allow light from the light source to pass therethrough, the photo-responsive device and the anode being disposed in the vacuum housing wherein the photo-responsive device is positioned to receive the light from the light source, the vacuum housing further comprising

an x-ray transmissive window being disposed in an aperture extending through a wall of the housing, wherein the anode emits x-rays through the x-ray transmissive window in response to receiving the emitted electrons from the electron emitter device.

[c4] 4.The electron emitter assembly of claim 1, wherein the electron emitter device comprises a field emitter array.

[c5] 5.The electron emitter assembly of claim 1, wherein the light source comprises a laser.

[c6] 6.The electron emitter assembly of claim 1, further comprising a mirror configured to receive light from the light source and to reflect the light towards the photo-responsive device.

[c7] 7.The electron emitter assembly of claim 6, wherein the mirror can rotate about at least two axes.

[c8] 8.The electron emitter assembly of claim 1, wherein the photo-responsive device comprises one of a photodiode and a photo-transistor.

[c9] 9.An electron emitter assembly, comprising:
a light source configured to emit light;
a plurality of photo-responsive devices and a plurality of electron emitter devices, each photo-responsive device

being operably coupled to a corresponding electron emitter device, each photo-responsive device inducing the corresponding electron emitter device to emit electrons in response to the photo-responsive device receiving at least a portion of the light; and
an anode receiving the emitted electrons from each of the electron emitter devices.

[c10] 10. The electron emitter assembly of claim 9, wherein the anode is configured to emit x-rays in response to receiving the emitted electrons from the electron emitter device.

[c11] 11. The electron emitter assembly of claim 10, further comprising:
a housing having a light receiving window configured to allow light from the light source to pass therethrough, the photo-responsive device and the anode being disposed in the vacuum housing wherein the photo-responsive device is positioned to receive the light from the light source, the vacuum housing further comprising an x-ray transmissive window being disposed in an aperture extending through a wall of the housing, wherein the anode emits x-rays through the x-ray transmissive window in response to receiving the emitted electrons from the electron emitter device.

- [c12] 12.The electron emitter assembly of claim 9, wherein each electron emitter device comprises a field emitter array.
- [c13] 13.The electron emitter assembly of claim 9, further comprising a mirror configured to receive light from the light source and to reflect the light towards at least one of the photo-responsive devices.
- [c14] 14.The electron emitter assembly of claim 13, wherein the mirror can rotate about at least two axes to reflect the light over a predetermined region to sequentially or randomly induce the plurality of photo-responsive devices to emit electrons.
- [c15] 15.The electron emitter assembly of claim 9, wherein each photo-responsive device comprises one of a photo-diode and a phototransistor.
- [c16] 16.The electron emitter assembly of claim 9, wherein the light source comprises a laser.
- [c17] 17. An electron emitter assembly, comprising:
a first light source configured to emit light having a first wavelength;
a second light source configured to emit light having a second wavelength;
first and second photo-responsive devices operably cou-

pled to an electron emitter device, the electron emitter device including a first electron emitter subassembly and a second electron emitter subassembly, the first photo-responsive device inducing the first electron emitter subassembly to emit electrons in response to receiving the light having the first wavelength, the second photo-responsive device inducing the second electron emitter subassembly to emit electrons in response to receiving the light having the second wavelength; and an anode receiving the emitted electrons from the electron emitter device.

[c18] 18. The electron emitter assembly of claim 17, wherein the anode is configured to emit x-rays in response to receiving the emitted electrons from the electron emitter device.

[c19] 19. The electron emitter assembly of claim 18, further comprising:
a housing having a light receiving window configured to allow light from the light source to pass therethrough, the photo-responsive device and the anode being disposed in the vacuum housing wherein the photo-responsive device is positioned to receive the light from the light source, the vacuum housing further comprising an x-ray transmissive window being disposed in an aperture extending through a wall of the housing,

wherein the anode emits x-rays through the x-ray transmissive window in response to receiving the emitted electrons from the electron emitter device.

[c20] 20. The electron emitter assembly of claim 17, wherein the electron emitter device comprises a field emitter array.

[c21] 21. The electron emitter assembly of claim 17, wherein each photo-responsive device comprises one of a photodiode and a phototransistor.

[c22] 22. The electron emitter assembly of claim 17, wherein the light source comprises a laser.

[c23] 23. A method for generating an electron beam, comprising:
emitting light onto a photo-responsive device operably coupled to an electron emitter device; and
energizing the electron emitter device to emit electrons towards an anode in response to the photo-responsive device receiving the light.

[c24] 24. The method of claim 23, further comprising receiving the emitted electrons at the anode and generating x-rays at the anode in response to receiving the emitted electrons.

- [c25] 25.The method of claim 23, wherein the light comprises a laser light.
- [c26] 26.The method of claim 23, wherein the electron emitter device comprises a field emitter array.
- [c27] 27.A method for generating electron beams, comprising:
emitting light having a first wavelength onto a first photo-responsive device operably coupled to an electron emitter device, the electron emitter device having a first electron emitter subassembly and a second electron emitter subassembly;
energizing the first electron emitter subassembly to emit electrons towards an anode in response to the first photo-responsive device receiving the light having the first wavelength;
emitting light having a second wavelength onto a second photo-responsive device operably coupled to the electron emitter device; and
energizing the second electron emitter subassembly to emit electrons towards the anode in response to the second photo-responsive device receiving the light having the second wavelength.
- [c28] 28.The method of claim 27, further comprising:
receiving the emitted electrons from the first electron emitter subassembly at the anode and emitting x-rays

from the anode in response to the anode receiving the emitted electrons from the first electron emitter sub-assembly; and
receiving the emitted electrons from the second electron emitter subassembly at the anode and emitting x-rays from the anode in response to the anode receiving the emitted electrons from the second electron emitter sub-assembly.

[c29] 29. The method of claim 27, wherein each photo-responsive device comprises one of a photodiode and a phototransistor.